

## **Appendix B**

# **DEMAND ESTIMATES AND PROJECTIONS**



An important aspect in the development of water supply plans is the development of reliable water demand estimates and projections. The Lower East Coast (LEC) Planning Area includes fast growing urban areas along the east coast and extensive agricultural lands as you move towards the west.

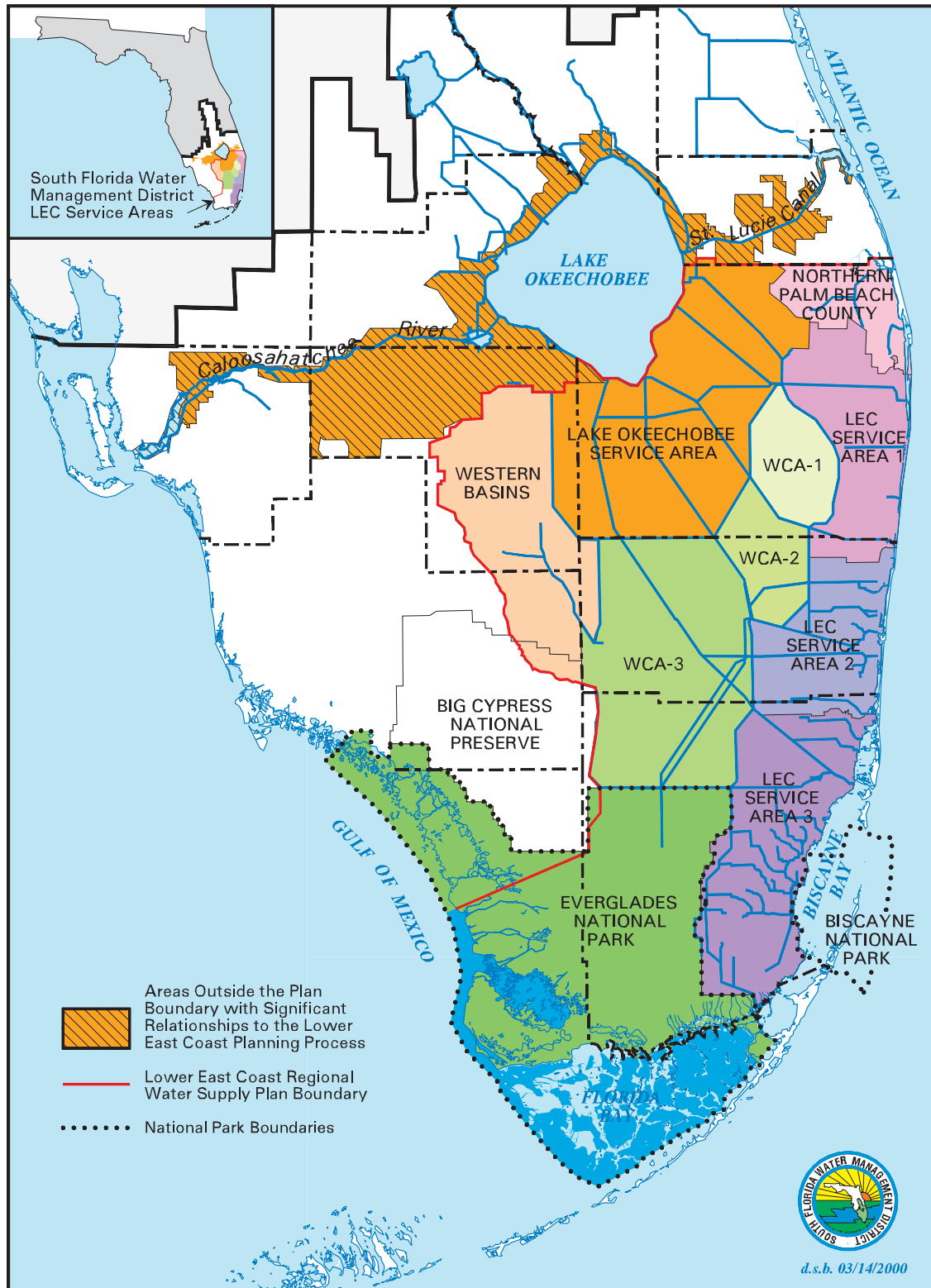
Urban and agricultural water demands are estimated and projected by county. The LEC Planning Area includes Palm Beach, Broward, and Miami-Dade counties, and portions of Hendry, Monroe, and Collier counties. Collier County water demands are addressed only in the *Lower West Coast Water Supply Plan*, because the portion of Collier County within the LEC Planning Area is entirely within the Big Cypress National Preserve. Conversely, the portion of Monroe County within the Lower West Coast (LWC) Planning Area is entirely within Everglades National Park, so all of the Monroe County water demands are addressed within the LEC Planning Area. Only the eastern portion of Hendry County is within the LEC Planning Area, so countywide water demands are adjusted and only the demands for the eastern portion are discussed within this plan.

Demand assessments were made for 1995 and 2020 for the following water use categories:

- Public Water Supply
- Domestic Self-Supplied
- Commercial and Industrial Self-Supplied
- Recreation Self-Supplied
- Thermoelectric Power Generation Self-Supplied
- Agricultural Self-Supplied

The first five categories are population related demand categories, or urban water uses, and are discussed in the Urban Demand section of this appendix. The category of Public Water Supply (PWS) refers to all potable water supplied by regional water treatment facilities with pumpage of 0.5 million gallons per day (MGD) or more to all customers, not just residential. The other four categories of urban water use are self-supplied. Commercial and industrial self-supplied refers to operations using over 0.1 MGD. Recreation self-supplied includes landscape and golf course irrigation demand. The landscape subcategory includes water used for parks, cemeteries, and other irrigation applications greater than 0.1 MGD. The golf course subcategory includes those operations not supplied by a PWS or regional reuse facility. Domestic self-supplied (DSS) is used to designate those households whose primary source of water is private wells and water treatment facilities with pumpages of less than 0.5 MGD. Thermoelectric self-supplied for power generation includes water used by electric power generating facilities for cooling purposes. The Agricultural Demand section contains the discussion of the agricultural self-supply water use category. Agriculture demand includes water used to irrigate crops, to water cattle, and for aquaculture (fish production).

Demand assessments for 1995 and projections for 2020 were obtained from the *Districtwide Water Supply Assessment* (SFWMD, 1998), with the exception of PWS. The



**Figure B-1.** Lower East Coast Planning Area.

PWS and the associated population projections were developed by South Florida Water Management District (SFWMD, District) staff using input provided by the utilities within the LEC Planning Area.

Section 373.0361, (2)(a)1, F.S., states that the level of certainty planning goal associated with identifying demands shall be based upon meeting the needs of a 1-in-10 year drought event. Therefore, water demand projections for the year 2020 included analyses under both average rainfall conditions and 1-in-10 drought year conditions. An average rainfall year is defined as rainfall with a 50 percent probability of being exceeded over a twelve-month period. A 1-in-10 year drought condition is defined as below normal rainfall with a 90 percent probability of being exceeded over a twelve-month period. This means that there is only a ten percent chance that less than this amount of rain will fall in any given year.

## PERCENTAGE OF USE

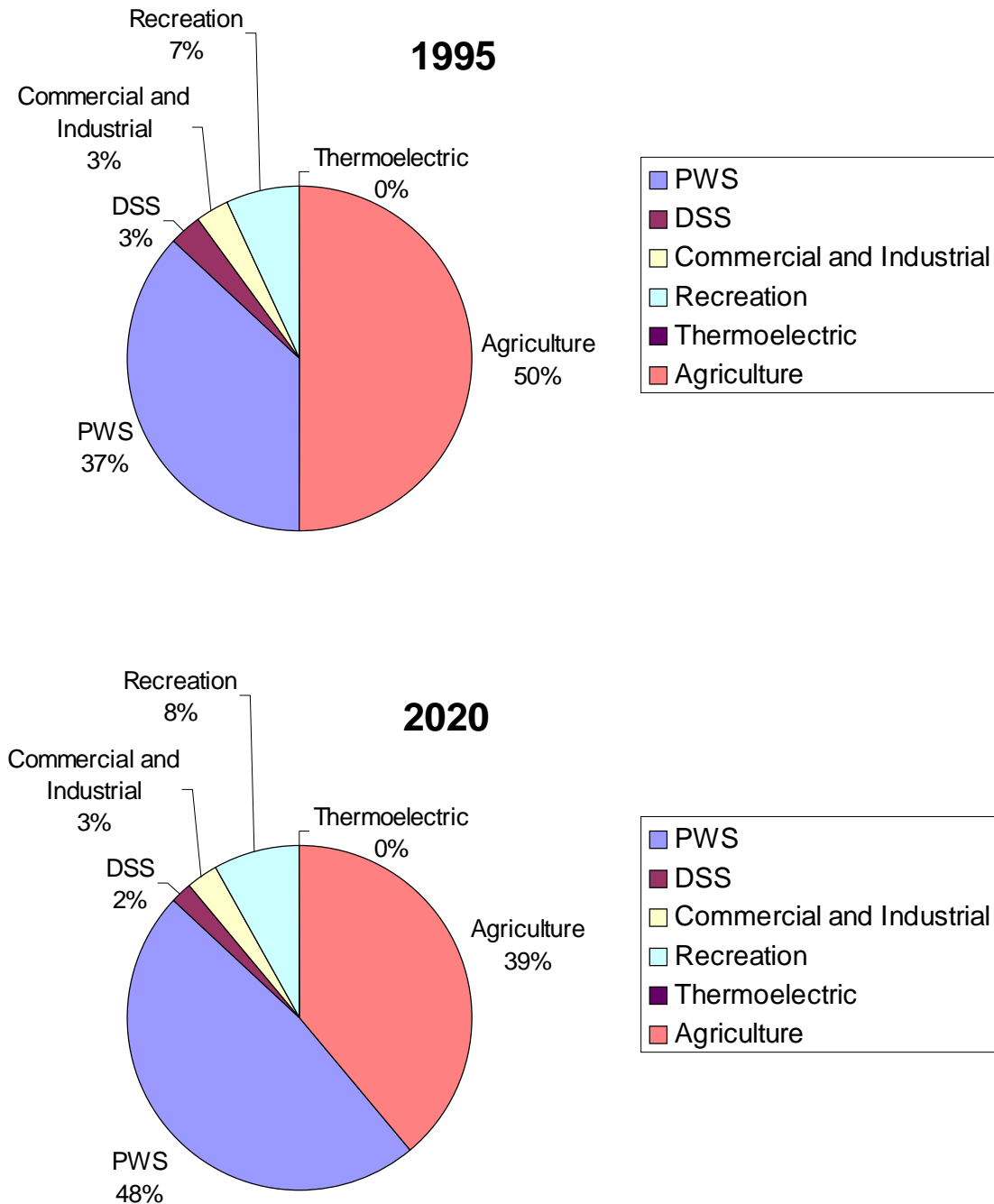
For 1995, the total estimated water demand for the LEC Planning Area was 766,015 million gallons for the year. This demand was used equally for agriculture and urban water uses (**Figure B-2**). Urban demand was 37 percent PWS, two percent DSS, three percent commercial and industrial self-supplied, and seven percent recreation self-supplied. Although thermoelectric power generation facilities withdraw large amounts of water, virtually all of this water is returned to the hydrologic system near the point of withdrawal.

From 1995 to 2020, the total projected average water demand is projected to increase by 20 percent from 766,015 to 920,124 million gallons per year (MGY), as shown in **Table B-1** and **Figure B-3**. PWS has the largest projected increase of 55 percent due to a projected increase in population, while agricultural water demand is projected to decrease by seven percent and become the second largest category of use. As agricultural demands decrease to 39 percent of the total demand, PWS will become the largest user by 2020, accounting for 48 percent of the total demand in that year.

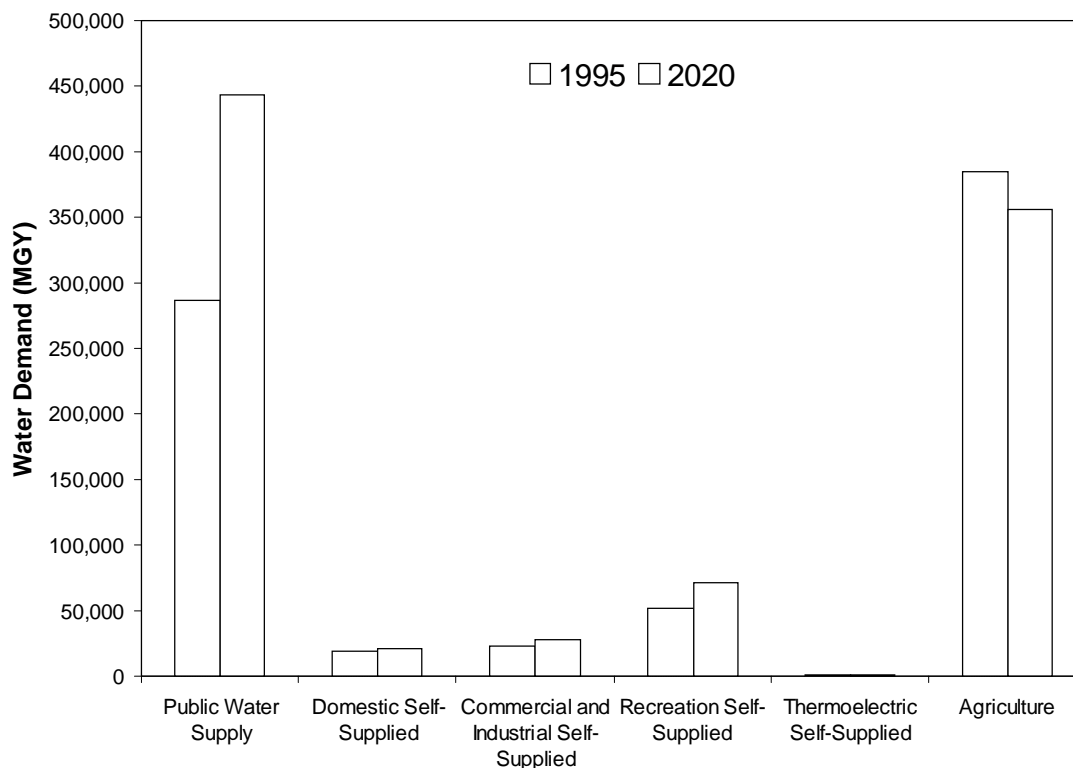
**Table B-1.** Overall Water Demands for 1995 and 2020.

Category	1995		2020		Percent Change 1995-2020	Projected 1-in-10 Demand 2020 (MGY)
	Estimated Demand (MGY)	Percent of Total	Projected Demand (MGY)	Percent of Total		
Public Water Supply	286,429	37%	443,411	48%	55%	493,799
Domestic Self-Supplied	19,166	3%	21,079	2%	10%	23,152
Commercial and Industrial Self-Supplied	22,859	3%	27,324	3%	20%	27,324
Recreation Self-Supplied	51,785	7%	71,131	8%	37%	87,023
Thermoelectric Self-Supplied	741	0.1%	741	0.1%	0.0%	741
Agriculture	385,035	50%	356,438	39%	-7%	506,803
Total	766,015		920,124		20%	1,138,842

## Distribution of Total Water Demand (Urban and Agricultural) by Water Use Category



**Figure B-2.** Distribution of Total Estimated Water Demands for 1995 and Total Projected Water Demands for 2020 in the Lower East Coast Planning Area.



**Figure B-3.** Comparison of 1995 Estimated and 2020 Projected Water Demands.

## URBAN WATER DEMAND

The major driving force behind urban demand is population. Population numbers for 1995 were taken from the U.S. Census. Population projections for the year 2020 used to determine PWS were based on figures submitted by PWS utilities. DSS population projections were obtained from the *Districtwide Water Supply Assessment* (SFWMD, 1998) (**Table B-2**), and used to develop urban demand projections. The total population of the planning area for 1995 was 4,518,401 and is projected to increase 58 percent to 7,139,453 in 2020. Miami-Dade, Broward, and Palm Beach counties account for approximately 98 percent of the planning area urban population. Therefore, urban demands are concentrated in these counties.

Urban demand is composed of five categories of use: Public Water Supply (PWS), Domestic Self-Supplied (DSS), commercial and industrial self-supplied, recreation self-supplied and thermoelectric self-supplied. PWS was the largest component (75 percent) of urban water demand in 1995, followed by recreation self-supplied (14 percent), commercial and industrial self-supplied (6 percent) and DSS (five percent). Urban water demand in 1995 was estimated to be about 380,980 MGY. Urban demand is projected to increase to almost 563,686 MGY in 2020. One-in-ten urban demand in 2020 is projected at 632,039 MGY.

**Table B-2.** Estimated 1995 and Projected 2020 Total, PWS, and DSS Population in the Lower East Coast Planning Area.

County	1995			2020		
	Total	PWS	DSS	Total	PWS	DSS
Palm Beach	976,358	809,088	101,157	1,679,266	1,577,014	102,252
Broward	1,412,942	1,380,362	23,049	1,967,707	1,936,658	31,049
Miami-Dade	2,046,078	1,989,282	24,443	3,374,678	3,334,013	40,665
Monroe	81,152	78,850	2,302	115,102	112,800	2,302
Eastern Hendry	1,871	0	1,871	2,700	0	2,700
Total LEC Planning Area	4,518,401	4,257,582	152,822	7,139,453	6,960,485	178,968

## Public Water Supply and Domestic Self-Supplied Demand

The estimated water demand for both PWS and DSS users was 305,595 MGY in 1995. These water demands are projected to increase 52 percent from 1995 to 2020 to a total water demand of 464,490 MGY. About seven percent of the population were self-supplied in 1995. This is projected to decrease to five percent in 2020. PWS and DSS water demands are presented in **Table B-3** for each county and for the planning area as whole.

**Table B-3.** Public Water Supply and Domestic Self-Supplied Water Demands.

County	1995				2020				Percent Change Between 1995 and 2020	
	PWS		DSS		PWS		DSS		PWS	DSS
	MGY	MGD	MGY	MGD	MGY	MGD	MGY	MGD		
Palm Beach	63,869	175	13,060	36	104,285	286	12,990	36	63%	-1%
Broward	81,152	222	1,843	5	114,085	313	2,497	7	41%	35%
Miami-Dade	141,408	387	3,971	11	225,041	617	5,227	14	59%	32%
Monroe	0	0	150	0.4	0	0	153	0.4	0%	2%
Eastern Hendry	0	0	142	0.4	0	0	212	0.6	0%	49%
Total LEC Planning Area	286,429	784	19,166	53	443,411	1,215	21,079	58	54%	10%

**Table B-4** breaks the demand down by utility. The 1995 base figures were generated based on actual pumpage records submitted to the District as a requirement of the Consumptive Use Permitting Program. To obtain the 2020 projected demand, the District sent each utility a questionnaire requesting their projected average raw water withdrawals for 2020. These projections were reviewed by District staff and some adjustments were made following discussions with the utilities. These projections were



used in the regional and subregional ground water models. In addition, utilities were requested to provide information concerning locations of future water withdrawals, proposed wells and wellfields, and future distribution systems. These data were incorporated into the LEC 2020 Base Case model runs. PWS service areas and existing wellfields in 1995 are shown in **Figures B-4, B-5, and B-6** and projected wellfields in 2020 are shown in **Figures B-7, B-8, and B-9** for Palm Beach, Broward, and Miami-Dade counties, respectively.

**Table B-4.** Public Water Supply Demands on the Surficial Aquifer by Utility.

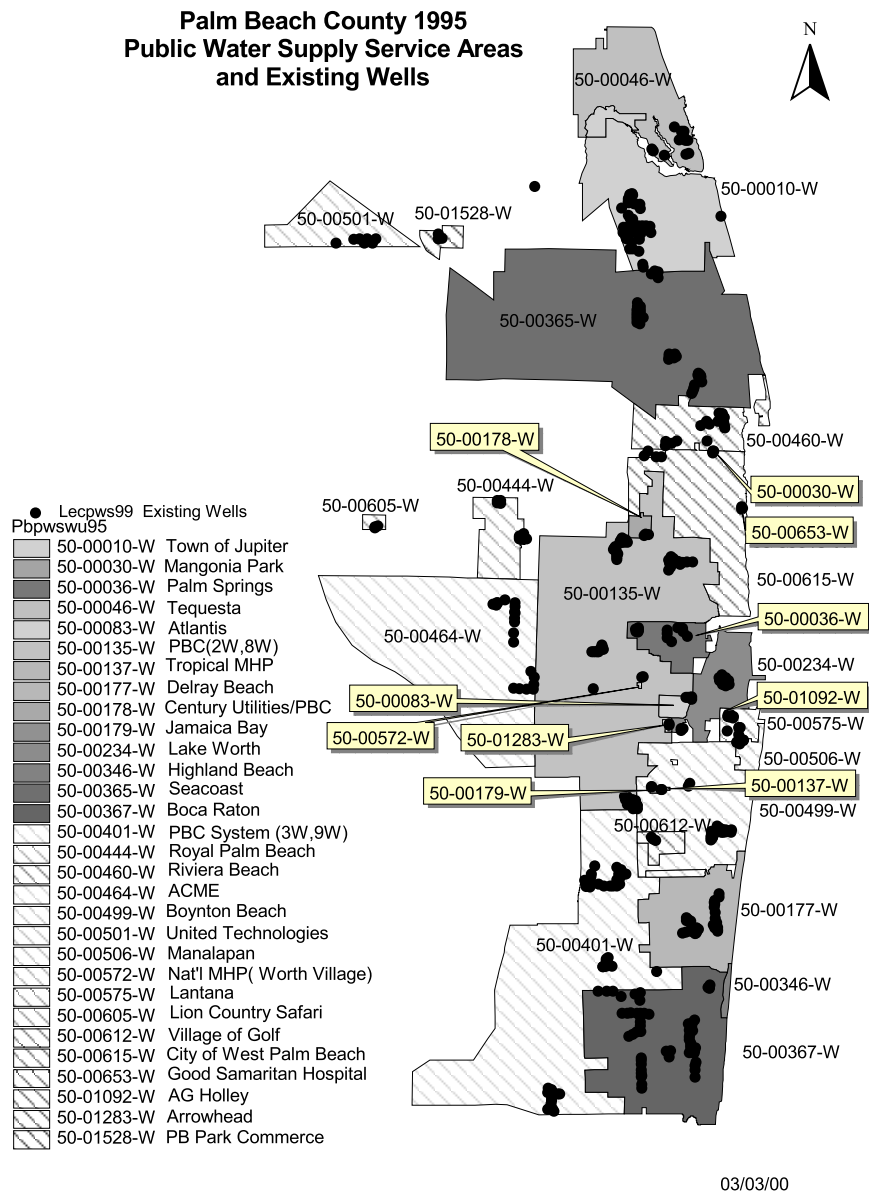
Utility	Permit #	Average Annual Demands (MGY)		Average Daily Demands (MGD)	
		1995 Base	2020 Base	1995 Base	2020 Base
North Palm Beach (NPB)					
Town of Jupiter	50-00010-W	3,463.85	4,818.00	9.49	13.20
Mangonia Park	50-00030-W	122.90	122.90	0.34	0.34
Tequesta	50-00046-W	512.97	638.75	1.41	1.75
Seacoast	50-00365-W	5,276.22	10,369.65	14.45	28.41
Riviera Beach	50-00460-W	3,270.72	4,275.00	8.96	11.71
Good Samaritan Hospital	50-00653-W	127.75	135.05	0.35	0.37
PB Park Commerce	50-01528-W	3.65	357.00	0.01	0.98
Total for NPB Service Area		12,778.06	20,716.35	35.01	56.76
LEC Service Area 1 (LECSA1)					
Deerfield Beach	06-00082-W	4,000.42	4,069.00	10.96	11.15
Parkland	06-00242-W	74.48	112.00	0.20	0.31
North Springs	06-00274-W	515.62	1,715.50	1.41	4.70
Palm Springs	50-00036-W	1,465.87	2,292.20	4.02	6.28
Atlantis	50-00083-W	17.68	0.00	0.05	0.00
PBC (Palm Bch Co) (2W,8W)	50-00135-W	6,821.62	10,442.65	18.69	28.61
Tropical MHP	50-00137-W	33.29	0.00	0.09	0.00
Delray Beach	50-00177-W	4,441.69	5,810.80	12.17	15.92
Century Utilities/PBC	50-00178-W	152.42	0.00	0.42	0.00
Jamaica Bay	50-00179-W	0.00	0.00	0.00	0.00
Lake Worth	50-00234-W	2,611.92	3,556.50	7.16	9.74
Highland Beach	50-00346-W	411.27	508.00	1.13	1.39
Boca Raton	50-00367-W	13,106.54	17,136.75	35.91	46.95
PBC System (3W, 9W)	50-00401-W	5,719.56	16,516.25	15.67	45.25
Royal Palm Beach	50-00444-W	803.70	0.00	2.20	0.00
ACME (Wellington)	50-00464-W	1,475.09	3,504.00	4.04	9.60
Boynton Beach	50-00499-W	3,226.66	6,278.00	8.84	17.20
Manalapan	50-00506-W	365.86	474.50	1.00	1.30
Nat'l MHP (Worth Village)	50-00572-W	70.24	97.00	0.19	0.27
Lantana	50-00575-W	752.29	890.60	2.06	2.44
Lion Country Safari	50-00605-W	18.49	42.00	0.05	0.12
Village of Golf	50-00612-W	152.66	196.00	0.42	0.54
City of West Palm Beach <sup>a</sup>	50-00615-W	9,206.80	15,330.00	25.22	42.00
AG Holley (St of FL)	50-01092-W	24.70	85.00	0.07	0.23
Arrowhead	50-01283-W	0.00	0.00	0.00	0.00
United Technologies	50-00501-W (old) 50-01663-W	212.57	408.80	0.58	1.12
Total for LEC Service Area 1		55,681.44	89,465.55	152.55	245.11

**Table B-4. Public Water Supply Demands on the Surficial Aquifer by Utility.(Continued)**

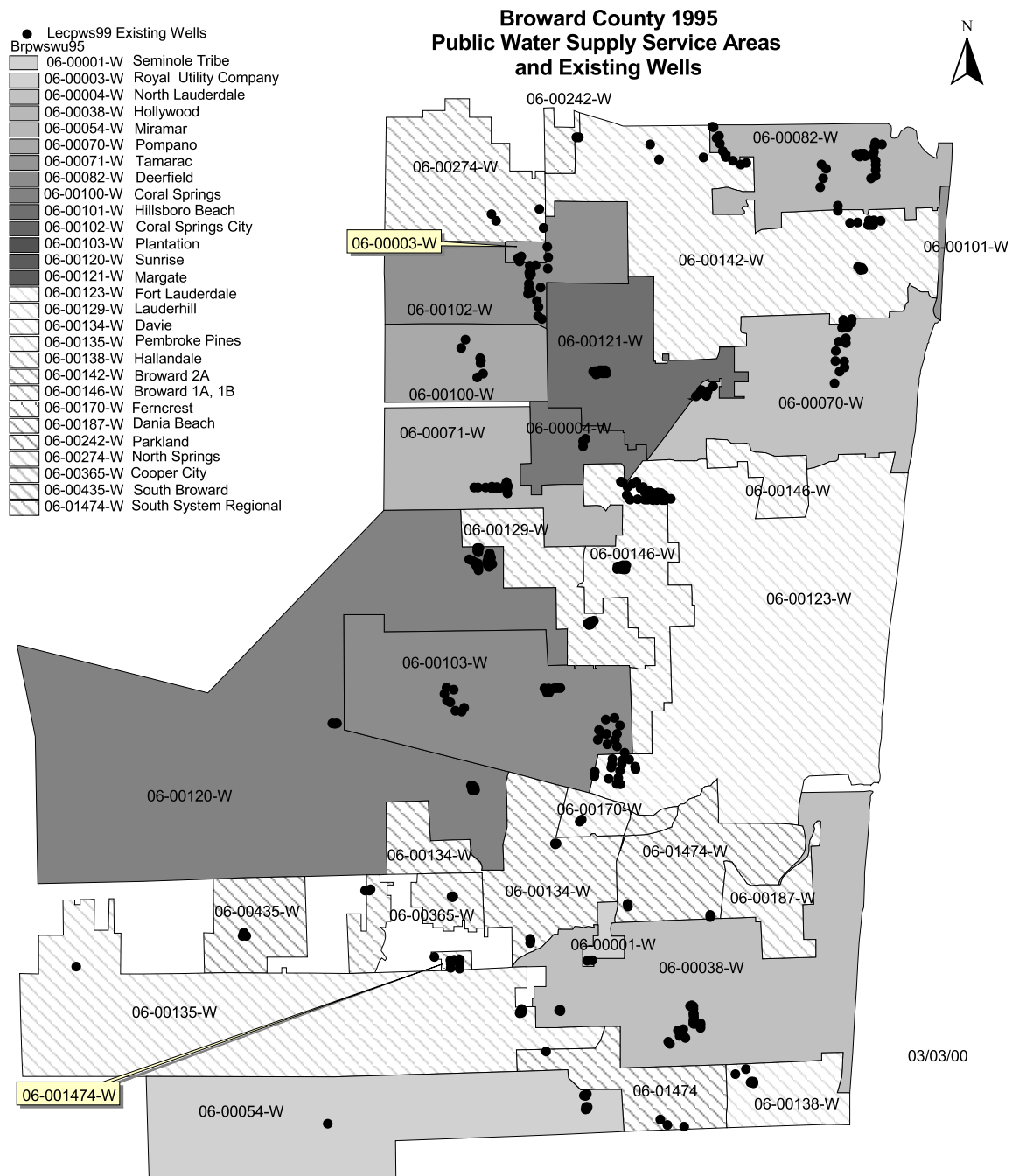
Utility	Permit #	Average Annual Demands (MGY)		Average Daily Demands (MGD)	
		1995 Base	2020 Base	1995 Base	2020 Base
LEC Service Area 2 (LECSA2)					
Seminole Tribe	06-00001-W	126.70	321.15	0.35	0.88
Royal Utility Company	06-00003-W	133.05	149.00	0.37	0.41
North Lauderdale	06-00004-W	1,107.97	2,299.50	3.04	6.30
Hollywood	06-00038-W	7,048.74	8,030.00	19.31	22.00
Miramar	06-00054-W	1,529.04	4,504.10	4.19	12.34
Pompano	06-00070-W	5,929.80	7,300.00	16.25	20.00
Tamarac	06-00071-W	2,044.49	3,650.00	5.60	10.00
Coral Springs I/D	06-00100-W	1,488.85	1,752.00	4.08	4.80
Hillsboro Beach	06-00101-W	313.85	360.00	0.86	0.99
Coral Springs City	06-00102-W	2,642.64	3,525.90	7.24	9.66
Plantation	06-00103-W	5,082.17	6,293.00	13.92	17.24
Sunrise	06-00120-W	6,612.50	11,351.50	18.12	31.10
Margate	06-00121-W	3,045.09	4,124.50	8.34	11.30
Ft. Lauderdale	06-00123-W	17,791.10	21,900.00	48.74	60.00
Lauderhill	06-00129-W	2,712.21	2,887.10	7.43	7.91
Davie	06-00134-W	1,112.42	1,929.00	3.05	5.29
Pembroke Pines	06-00135-W	3,405.35	7,300.00	9.33	20.00
Hallandale	06-00138-W	1,261.06	1,277.50	3.45	3.50
Broward 2A (east)	06-00142-W	5,305.05	4,015.00	14.53	11.00
Broward 3A/3C (Picolo)	06-00145-W (old) 06-01474-W	964.80	5,657.50	2.64	15.50
Broward 1A,1B	06-00146-W	3,406.95	4,380.00	9.33	12.00
Broward 3B	06-00147-W (old) 06-01474-W	793.50	0.00	2.17	0.00
Ferncrest	06-00170-W	285.35	401.00	0.78	1.10
Dania Beach	06-00187-W	898.93	730.00	1.85	2.00
Cooper City	06-00365-W	1,278.26	2,226.00	3.50	6.10
South Broward	06-00435-W	241.89	0.00	0.66	0.00
Broward North Regional	06-01634-W	0.00	1,825.00	0.00	5.00
Total for LEC Service Area 2		76,561.76	108,188.75	209.13	296.41
LEC Service Area 3 (LECSA3)					
FKAAb	13-00005-W	5,136.91	6,935.00	14.07	19.00
Alexander Orr (WASD)	13-00017-W	61,375.50	103,065.05	168.15	282.37
Florida City	13-00029-W	837.97	1,025.65	2.30	2.81
WASD- Hialeah Preston	13-00037-W	60,875.50	76,723.00	166.78	210.20
REX (WASD-S Dade)	13-00040-W	2,209.80	17,395.90	6.05	47.66
Homestead	13-00046-W	2,354.09	5,694.00	6.45	15.60
North Miami	13-00059-W	2,622.19	3,252.55	7.18	8.91
North Miami Beach	13-00060-W	5,618.61	10,950.00	15.39	30.00
Opa Locka	13-00065-W	0	0	0	0
Homestead AFB	13-00068-W	377.80	0.00	1.04	0.00
Total for LECSA 3		141,408.37	225,041.15	387.41	616.55
LEC Planning Area Total		286,429.63	443,411.80	784.10	1,214.82

a. Demand figures are from surface water.

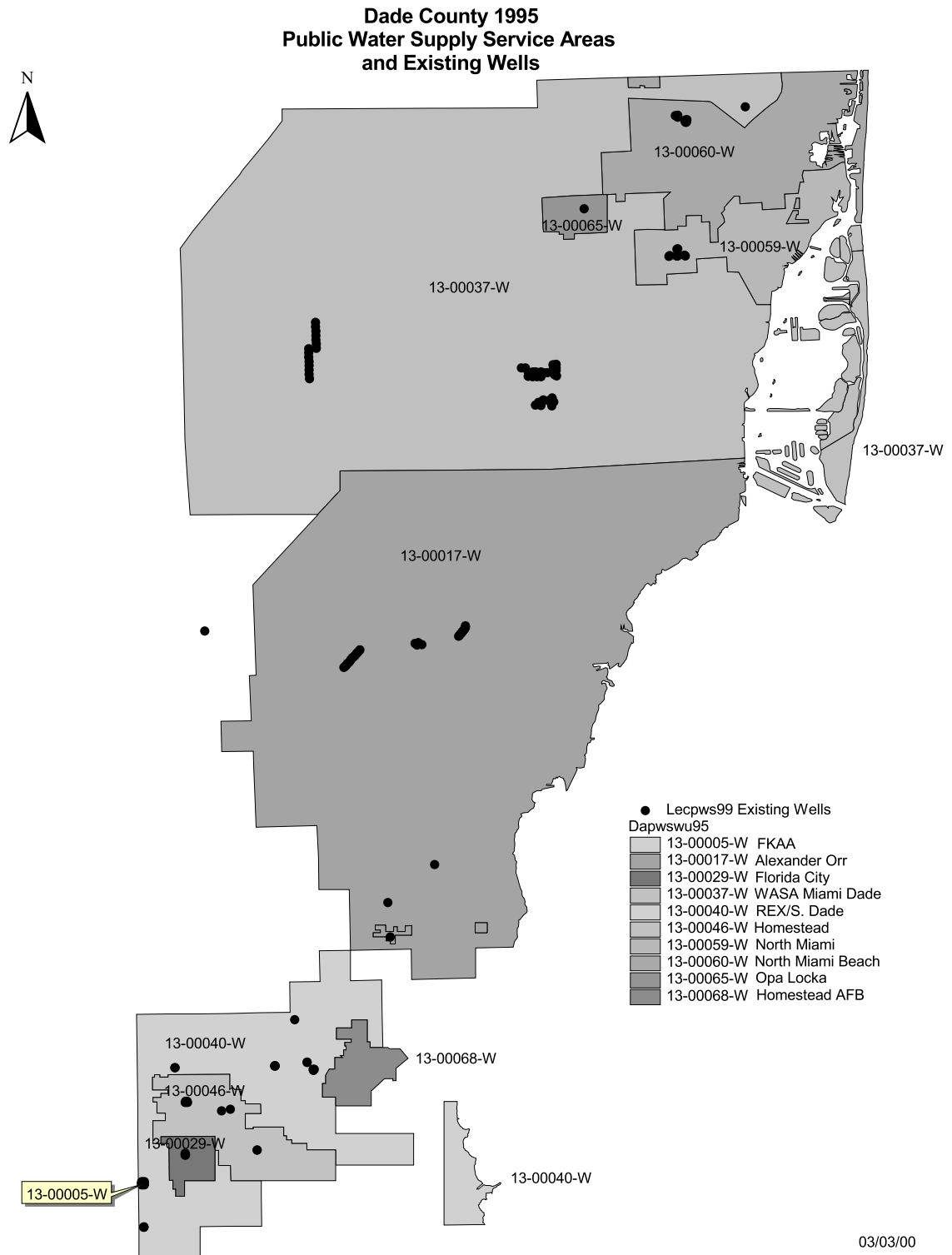
b. Demand figures are to supply Monroe County.



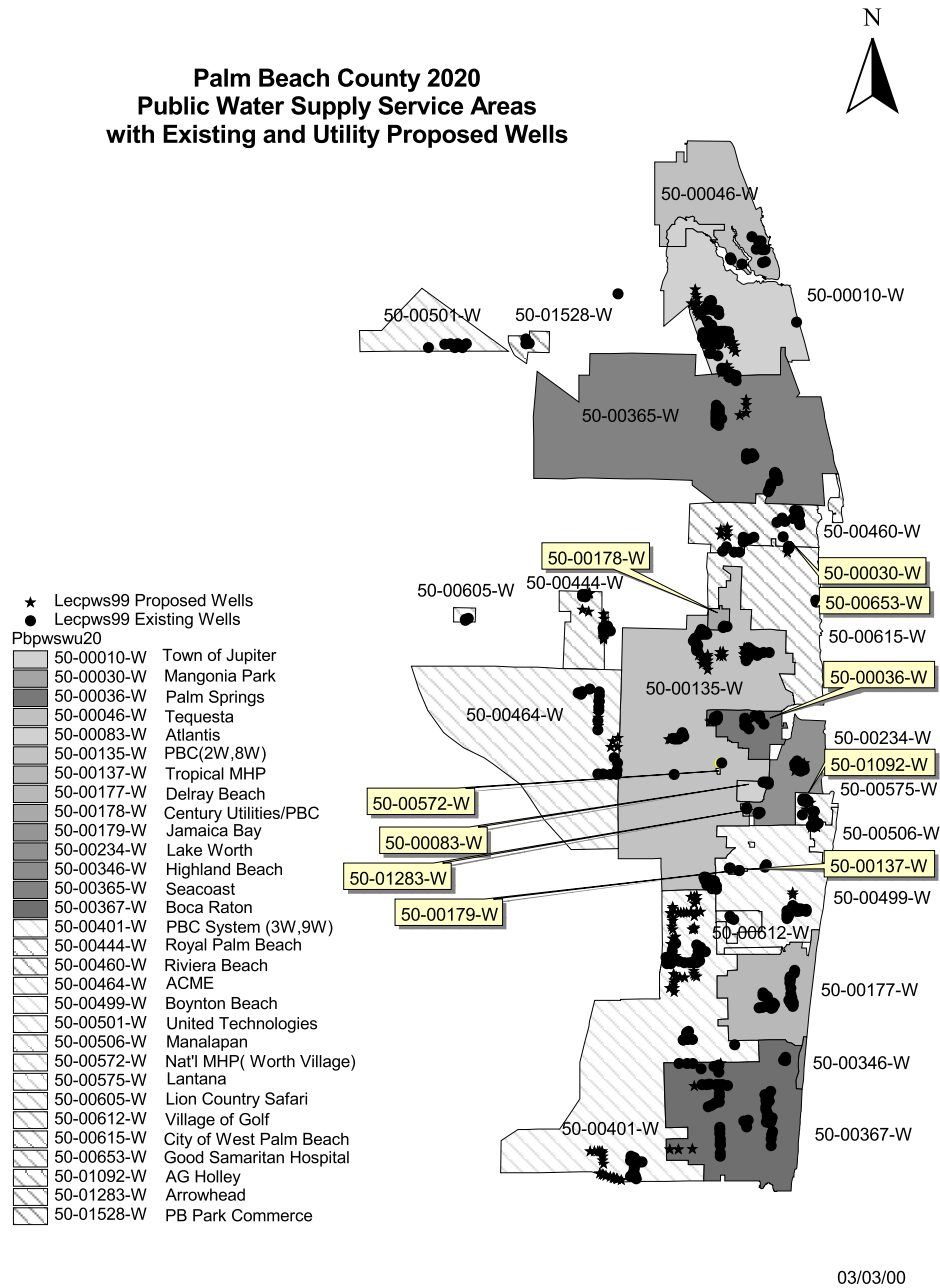
**Figure B-4.** Palm Beach County Public Water Supply Service Areas and Existing Wellfields in 1995.



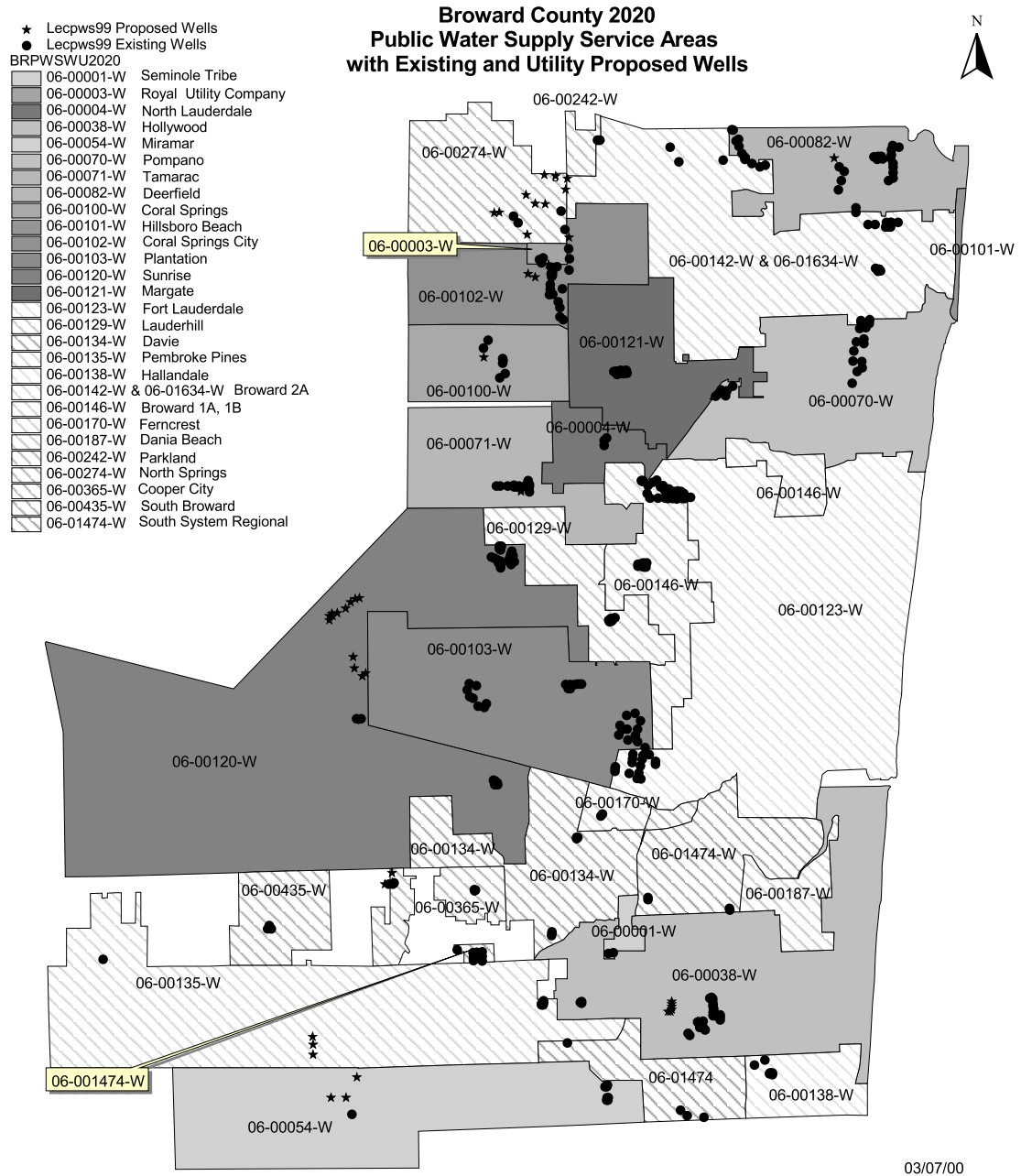
**Figure B-5.** Broward County Public Water Supply Service Areas and Existing Wellfields in 1995.



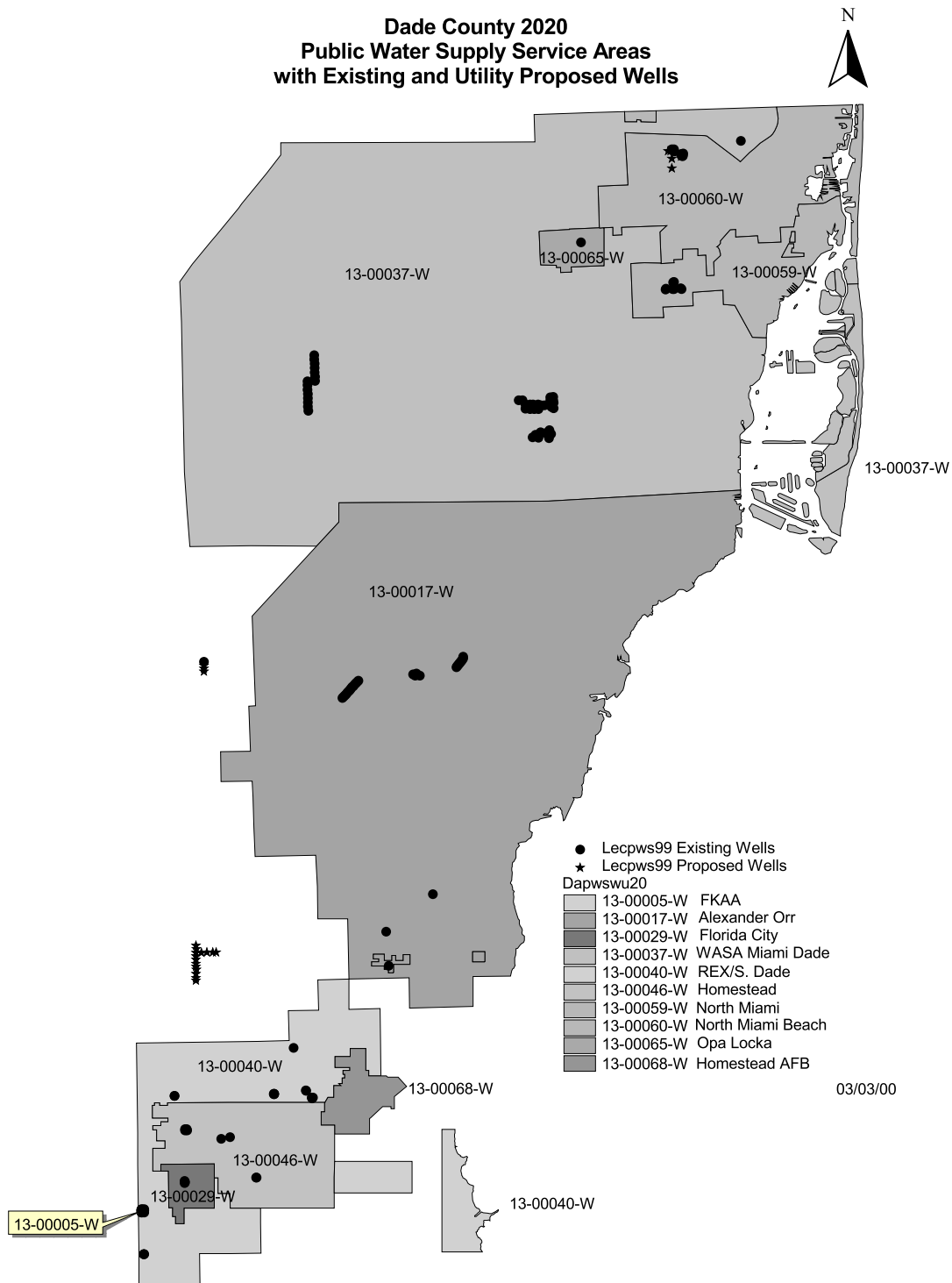
**Figure B-6.** Miami-Dade County Public Water Supply Service Areas and Existing Wellfields in 1995.



**Figure B-7.** Palm Beach County Public Water Supply Service Areas and Projected Wellfields in 2020.



**Figure B-8.** Broward County Public Water Supply Service Areas and Projected Wellfields in 2020.



**Figure B-9.** Miami-Dade County Public Water Supply Service Areas and Projected Wellfields in 2020.



## Commercial and Industrial Self-Supplied

In 1995, commercial and industrial self-supplied demand for the planning area was estimated at 22,859 MGY (**Table B-5**). This demand is projected to increase to 27,324 MGY by 2020. In 1995, Palm Beach and Miami-Dade counties were the largest commercial and industrial self-supplied users of the LEC Planning Area with demands of 10,939 and 10,556 MGY, respectively. These two counties are projected to continue being the largest users in 2020 within this water use category with demands of 12,167 and 13,300 MGY, respectively. Broward and Monroe counties have relatively small commercial and industrial self-supplied demands and eastern Hendry County has none. These estimates and projections do not include commercial and industrial demands supplied by public utilities, as these are already included in the PWS demands.

**Table B-5.** Commercial and Industrial Self-Supplied Demand.

County	1995		2020	
	MGY	MGD	MGY	MGD
Palm Beach	10,939	30	12,167	33
Broward	1,338	4	1,824	5
Miami-Dade	10,556	29	13,300	36
Monroe	26	0.1	33	0.1
Eastern Hendry	0	0	0	0
Total LEC Planning Area	22,859	63	27,324	75

## Landscape and Recreational Self-Supplied Demand

In 1995, the LEC Planning Area used an estimated 51,785 MGY self-supplied water for landscaping and recreation, including golf course irrigation (**Table B-6**). This demand is projected to increase to 71,131 MGY by 2020 in response to increased urban development within the planning area. Palm Beach and Broward counties had the highest estimated demand in 1995 for this water use category using 23,991 and 21,916 MGY, respectively. These counties are projected to remain the largest users during the next 20 years with projected demands of 35,828 and 27,643 MGY, respectively. These estimates and projections do not include recreational demands supplied by public utilities, as these are already included in the PWS demands.

**Table B-6.** Landscape and Recreational Self-Supplied Demand.

County	1995		2020	
	MGY	MGD	MGY	MGD
Palm Beach	23,991	66	35,828	98
Broward	21,916	60	27,643	76
Miami-Dade	5,078	14	6,860	19
Monroe	800	2	800	2
Eastern Hendry	0	0	0	0
Total LEC Planning Area	51,785	142	71,131	195

## AGRICULTURAL WATER DEMAND

### Summary of Agricultural Demand

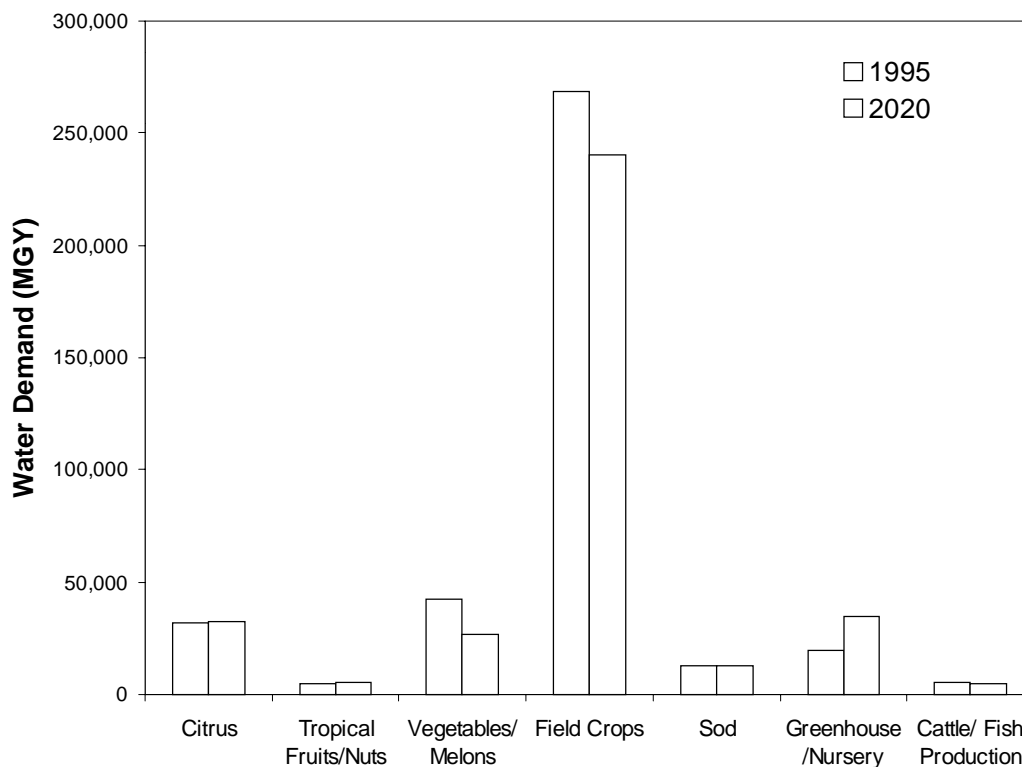
There are seven categories of agricultural water demand analyzed in this section: citrus, tropical fruit, vegetables, field crops, sod, greenhouse/nursery, and cattle and fish production (**Table B-7**). Field crops include sugarcane, rice, field corn, soybean, and sorghum. Agricultural water demand was estimated for 1995 to be approximately 385,035 MGY (**Table B-1**). In 1995, field crops used 70 percent and vegetables used 11 percent of the overall agricultural water demand. The remaining crops accounted for approximately 18 percent of the total agricultural demand. The combined water demand for cattle watering, irrigation of improved pasture, and aquaculture account for approximately one percent of total agricultural demand.

**Table B-7.** Water Demand (MGY) and Irrigated Acreage by Crop Type.

Category	1995		2020		Percent Change 1995-2020		Projected 2020 1-in-10 Demands
	Estimated Demands (MGY)	Total Irrigated Acres/ Head of Cattle	Estimated Demands (MGY)	Total Irrigated Acres/ Head of Cattle	Demands	Acreage	
Citrus	31,722	43,408	32,270	43,641	2%	1%	39,324
Tropical Fruits/Nuts	4,786	8,200	5,048	8,650	5%	5%	6,868
Vegetables/ Melons	42,412	98,772	26,661	64,057	-37%	-35%	31,517
Field Crops	268,847	368,982	240,498	326,707	-11%	-11%	364,903
Sod	12,667	10,100	12,667	10,100	0%	0%	16,299
Greenhouse /Nursery	19,597	16,383	34,468	29,597	76%	81%	43,066
Cattle/Fish Production	5,004	0	4,826	0	-4%	NA	4,826
Total Planning Area*	385,035	545,845	356,438	482,752	-7%	-12%	506,803

The LEC Planning Area is experiencing a slight decrease in agricultural growth, especially in vegetable acreage within Palm Beach County. Broward County vegetable production is projected to continue declining to an insignificant level by 2020. Miami-Dade County, however, is projecting a slight overall increase due to significant increase in greenhouse/nursery production. Overall, agricultural water demand is forecast to decrease by seven percent to 356,438 MGY in 2020 (**Table B-1**). Approximately two-thirds of the agricultural water demand in 2020 is anticipated to be for sugarcane. **Figure B-10** presents a graphical comparison of agricultural demand by crop type for 1995 and 2020.

Descriptions of the agricultural acreage in each county, projection methodology, and the calculation of irrigation requirements and other agricultural water use, including data sources, are detailed in the *Districtwide Water Supply Assessment* (SFWMD, 1998).



**Figure B-10.** Comparison of 1995 and 2020 Agricultural Demands for the Lower East Coast Planning Area.

## Citrus

Citrus acreage in Palm Beach, Broward, and Miami-Dade counties is projected to decline by 2020. Miami-Dade County citrus is dominated by lime production. Eastern Hendry County citrus acreage has continuously increased due to interregional movement of citrus from central to southwest Florida following the severe freezes in the mid-1980s. Citrus acreage in the planning area is projected to grow slightly from 43,408 acres in 1995 to 43,641 acres in 2020. This slight growth in acreage represents an increase in average irrigation requirements from 31,722 MGY in 1995 to 32,270 MGY in 2020. The 1-in-10 demands estimated for 2020 are 39,324 MGY.

## Tropical Fruits

Within the LEC Planning Area, tropical fruits (primarily avocados, mangoes, and papayas) are produced only in Miami-Dade County. In 1995, Miami-Dade County had 8,200 acres of tropical fruits. The acreage is projected to increase to 8,650 acres in 2020. Average irrigation requirements for this acreage were estimated at 4,786 MGY in 1995 and projected at 5,048 MGY for 2020. The projected 2020 1-in-10 irrigation requirement is 6,868 MGY (**Table B-7**).

## Vegetables and Melons

Vegetable crops grown in the LEC Planning Area include cucumbers, peppers, tomatoes, squash, eggplant, watermelons, carrots, celery, lettuce, escarole, endive, radishes, sweet corn, strawberries, Latin vegetables, snap beans, and potatoes. Different types of vegetables are often grown interchangeably. In 1995, the LEC Planning Area had 98,772 acres of land used for vegetable production. This is projected to decrease to 64,057 acres in 2020 due to urban development within the planning area. The average irrigation requirement for vegetable crops was estimated at 42,412 MGY in 1995 and is projected to be 26,661 MGY in 2020. The 1-in-10 irrigation requirement for the 2020 vegetable acreage is 31,517 MGY (**Table B-7**).

## Field Crops

### Sugarcane

Sugarcane is grown in both Palm Beach County and eastern Hendry County. As a result of the cultivation practices used for sugarcane (ratoon and fallow), 25 percent of the land used for sugarcane production is fallow in any given year. This fallow land does not require irrigation and, therefore, is not included in the demand projections presented here.

In 1995, the LEC Planning Area total acreage of sugarcane was estimated at 366,332 acres. It is projected to decrease to 322,432 acres by 2020. Average irrigation requirements were estimated at 253,299 MGY in 1995 and are projected to decrease to 224,635 MGY by 2020. The 1-in-10 irrigation requirement for the planning area is projected to be 346,535 MGY in 2020.

Sugarcane is the dominant crop in the Everglades Agricultural Area (EAA). Production of sugarcane in the EAA (Palm Beach County) was estimated at 328,592 acres in 1995 requiring an average irrigation requirement of 202,614 MGY. This acreage is forecast to decline to 285,542 acres by 2020, primarily due to the conversion of agricultural land into Stormwater Treatment Areas. The associated average irrigation requirements are projected to decrease to 176,069 MGY by 2020.

The irrigated sugarcane acreage in eastern Hendry County was 37,740 acres in 1995 and declined slightly to 36,890 acres (for sugar and seed) between 1995 and 1997. The acreage is projected to stay at that level through 2020. The average irrigation requirement of eastern Hendry County in 1995 was estimated at 49,685 MGY. This is projected to decrease to 48,566 MGY in 2020. The 1-in-10 irrigation requirement for the 2020 sugarcane acreage in eastern Hendry County is projected to be 57,929 MGY.

### Other Field Crops

Rice is also grown in the EAA (Palm Beach County) and in eastern Hendry County. It is grown during the summer months in rotation with sugarcane or winter vegetables and takes place on land that would otherwise be fallow. Total rice acreage in

the Lower East Coast Planning Area was assessed at 22,100 acres in 1995, and is projected to decrease to 20,900 acres by 2020. Average irrigation requirements were estimated at 15,075 MGY for 1995 and projected to be 14,064 MGY by 2020. The 1-in-10 demands projected for 2020 are 16,392 MGY.

## **Sod**

In 1995, irrigated sod acreage within the LEC Planning Area was estimated at 10,100 acres and is expected to remain the same through 2020. The associated average irrigation requirement is estimated at 12,667 MGY through 2020. The 1-in-10 irrigation requirement for sod for 2020 is projected to be 16,299 MGY (**Table B-7**).

## **Greenhouse/Nursery**

In 1995, greenhouse/nursery operations in the planning area were estimated to use 16,383 acres. This acreage is projected to increase 81 percent to 29,597 acres by the year 2020. Average water demands for greenhouse/nurseries in the planning area were estimated at 19,597 MGY in 1995 and is projected to increase to 34,468 MGY in 2020. The 1-in-10 irrigation requirement associated with the projected 2020 acreage is projected to be 43,066 MGY (**Table B-7**).

## **Cattle and Fish Production**

Demand for cattle watering and barn washing is associated with cattle production (which is in turn associated with pasture acreage). Aquaculture, associated with fish production, is only located in Palm Beach and Miami-Dade counties. Combined cattle and fish production was assessed at 5,004 MGY in 1995, and is projected to decline slightly to 4,826 MGY in 2020 (**Table B-7**). This decline is related to the displacement of pasture land by other agricultural or urban land uses.

## **TOTAL IRRIGATED ACREAGE**

Total irrigated acreage or the LEC Planning Area is summarized in **Table B-8**. Monroe County has no agriculture acreage.

**Table B-8.** Total Irrigated Agriculture Acreage for the LEC Planning Area.

Use Classification	Total Irrigated Acreage	
	1995	2020
<b>PALM BEACH COUNTY</b>		
Citrus	12,746	10,121
Vegetables/Melons	43,245	23,874
Field Crops	328,592	285,542
Sod	6,000	6,000
Greenhouse/Nursery	5,045	10,175
<b>TOTAL IRRIGATED AGRICULTURE ACREAGE FOR PALM BEACH COUNTY</b>	395,628	335,712
<b>BROWARD COUNTY</b>		
Citrus	108	0
Vegetables/Melons	579	0
Greenhouse/Nursery	2,668	2,668
<b>TOTAL IRRIGATED AGRICULTURE ACREAGE FOR BROWARD COUNTY</b>	3,355	2,668
<b>MIAMI-DADE COUNTY</b>		
Citrus	2,618	1,667
Tropical Fruits/Nuts	8,200	8,650
Vegetables/Melons	49,348	34,023
Field Crops	3,500	4,275
Greenhouse/Nursery	8,403	16,278
<b>TOTAL IRRIGATED AGRICULTURE ACREAGE FOR MIAMI-DADE COUNTY</b>	72,069	64,893
<b>MONROE COUNTY</b>		
<b>TOTAL IRRIGATED AGRICULTURE ACREAGE FOR MONROE COUNTY</b>	0	0
<b>EASTERN HENDRY COUNTY</b>		
Citrus	27,936	31,853
Vegetables/Melons	5,600	6,160
Field Crops	36,890	36,890
Sod	4,100	4,100
Greenhouse/Nursery	267	476
<b>TOTAL IRRIGATED AGRICULTURE ACREAGE FOR EASTERN HENDRY COUNTY</b>	74,793	79,479
<b>LEC PLANNING AREA TOTAL IRRIGATED AGRICULTURAL ACREAGE</b>	545,845	482,752

## TOTAL AVERAGE ANNUAL WATER DEMAND

Estimated and projected demands for the LEC Planning Area are shown in **Table B-9**. Urban demand is summarized by water use category and agricultural demand and irrigated acreage are summarized by crop type.

**Table B-9.** Annual Average Water Demand by Use Classification.

Use Classification	Average Annual Water Demand (MGY)	
	1995	2020
<b>PALM BEACH COUNTY</b>		
<b>Urban</b>		
Public Water Supplied	63,869	104,285
Domestic Self-Supplied	13,060	12,990
Commercial and Industrial Self-Supplied	10,939	12,167
Recreation	23,991	35,828
Thermoelectric	69	69
<b>TOTAL URBAN</b>	<b>111,928</b>	<b>165,339</b>
<b>Agriculture</b>		
Citrus	8,034	6,341
Vegetables/Melons	19,170	9,566
Field Crops	214,679	188,069
Sod	5,695	5,695
Greenhouse/Nursery	8,202	14,794
Cattle Watering/Aquaculture	778	778
<b>TOTAL AGRICULTURE</b>	<b>256,558</b>	<b>225,243</b>
<b>TOTAL PALM BEACH COUNTY WATER DEMAND</b>	<b>368,486</b>	<b>390,582</b>
<b>BROWARD COUNTY</b>		
<b>Urban</b>		
Public Water Supplied	81,152	114,085
Domestic Self-Supplied	1,843	2,497
Commercial and Industrial Self-Supplied	1,338	1,824
Recreation	21,916	27,643
Thermoelectric	179	179
<b>TOTAL URBAN</b>	<b>106,428</b>	<b>146,228</b>
<b>Agriculture</b>		
Citrus	67	0
Vegetables/Melons	413	0
Greenhouse/Nursery	2,485	2,485
Cattle Watering/Aquaculture	248	78
<b>TOTAL AGRICULTURE</b>	<b>3,213</b>	<b>2,563</b>
<b>TOTAL BROWARD COUNTY WATER DEMAND</b>	<b>109,641</b>	<b>148,791</b>

**Table B-9. Annual Average Water Demand by Use Classification.(Continued)**

Use Classification	Average Annual Water Demand (MGY)	
	1995	2020
<b>MIAMI-DADE COUNTY</b>		
<b>Urban</b>		
Public Water Supplied	141,408	225,041
Domestic Self-Supplied	3,971	5,227
Commercial and Industrial Self-Supplied	10,556	13,300
Recreation	5,078	6,860
Thermoelectric	493	493
<b>TOTAL URBAN</b>	<b>161,506</b>	<b>250,921</b>
<b>Agriculture</b>		
Citrus	1,996	1,271
Tropical Fruits/Nuts	4,786	5,048
Vegetables/Melons	19,526	13,462
Field Crops	1,473	1,799
Greenhouse/Nursery	8,456	16,380
Cattle Watering/Aquaculture	3,701	3,701
<b>TOTAL AGRICULTURE</b>	<b>39,938</b>	<b>41,661</b>
<b>TOTAL MIAMI-DADE COUNTY WATER DEMAND</b>	<b>201,444</b>	<b>292,582</b>
<b>MONROE COUNTY</b>		
<b>Urban</b>		
Public Water Supplied	0	0
Domestic Self-Supplied	150	153
Commercial and Industrial Self-Supplied	126	33
Recreation	800	800
<b>TOTAL URBAN</b>	<b>976</b>	<b>986</b>
<b>Agriculture</b>		
<b>TOTAL AGRICULTURE</b>	<b>0</b>	<b>0</b>
<b>TOTAL MONROE COUNTY WATER DEMAND</b>	<b>976</b>	<b>986</b>
<b>EASTERN HENDRY COUNTY</b>		
<b>Urban</b>		
Public Water Supplied	0	0
Domestic Self-Supplied	142	212
<b>TOTAL URBAN</b>	<b>142</b>	<b>212</b>
<b>Agriculture</b>		
Citrus	21,625	24,658
Vegetables/Melons	3,303	3,633
Field Crops	52,695	50,630
Sod	6,972	6,972
Greenhouse/Nursery	454	809
Cattle Watering/Aquaculture	277	269
<b>TOTAL AGRICULTURE</b>	<b>85,326</b>	<b>86,971</b>
<b>TOTAL EASTERN HENDRY COUNTY WATER DEMAND</b>	<b>85,468</b>	<b>87,183</b>
<b>LEC PLANNING AREA TOTAL WATER DEMAND</b>	<b>766,015</b>	<b>920,124</b>



## CALOOSAHATCHEE BASIN WATER DEMANDS

Water demand for the Caloosahatchee Basin must be considered in the development of the LEC Water Supply Plan since Lake Okeechobee is the basin's main source of water. The C-43 Canal (Caloosahatchee River) is the most significant source of surface water in the Caloosahatchee Basin. The C-43 Canal receives water from Lake Okeechobee, runoff within the basin, and base flow from the Surficial Aquifer System. The river supplies water for public supply, agriculture, and natural systems.

The Lake Okeechobee Demand (Service) Area, which is defined as the area that is or could be supplied by surface water from the Caloosahatchee River, is the primary source for agricultural irrigation and potable surface water in the Caloosahatchee Basin. This area extends from the Franklin Lock (S-798) eastward to the Moore Haven Lock (S-77) and includes land in Lee, Glades, and Hendry counties.

Nonenvironmental surface water demands within the basin are primarily agricultural with some PWS and commercial/industrial uses. Commercial and industrial demand is relatively small (one percent) and difficult to generalize, so an average demand is not calculated for this category.

### Public Water Supply

Metered data of withdrawals from the C-43 Canal by the primary PWS utilities within the basin, the City of Fort Myers and Lee County Utilities, were obtained from records to estimate PWS demands for 1995. Both utilities withdraw water from the river at Olga. The City of Fort Myers uses this water to recharge the surficial aquifer at its wellfield and then pumps it from the surficial aquifer for treatment using membrane-softening technology. Lee County Utilities treats the water using lime softening technology at its Olga water treatment plant. In 1995, the combined surface water usage by both utilities was approximately 10.5 MGD for average daily usage and approximately 16.0 MGD for maximum daily usage.

The City of Fort Myers is moving to a Floridan Aquifer source by 2020 and withdrawals from the C-43 Canal are not expected to continue. Therefore, the City of Fort Myers surface water withdrawals were not included in the future demands on the surface water of the C-43 Canal. Lee County Utilities projects its 2020 maximum daily use rate of C-43 Canal water to be 22.0 MGD. **Table B-10** compares the 1995 estimated demands and the 2020 projected demands from the C-43 Canal.

**Table B-10.** Estimated 1995 and Projected 2020 Public Water Supply Demand from the C-43 Canal.

Utility	1995		2020	
	Average Daily Use (MGD)	Maximum Daily Use (MGD)	Average Daily Use (MGD)	Maximum Daily Use (MGD)
City of Fort Myers	7.3	12.2	0.0	0.0
Lee County Utilities	3.1	4.1	16.0	22.0
Total Water Demand from the C-43 Canal	10.4	16.3	16.0	22.0

## Agriculture Self-Supplied

### Irrigated Acreage

Three crop types are grown within the Caloosahatchee Water Management Planning Area: citrus, sugarcane, and vegetables. Citrus, which occupies more than 91,000 acres, is the dominant irrigated crop in the basin. Citrus acreage has increased in the Caloosahatchee Basin during the past two decades. This growth is associated with the movement of citrus southward from Central Florida following several severe winter freezes in the 1980s. The basin has 75,000 acres in sugarcane production. It is primarily grown in close vicinity to the Everglades Agricultural Area (EAA), in Hendry and Glades counties. Sugarcane acreage has continued to increase since 1995, and is expected to continue in the future.

The Southwest Florida Regional Planning Council (SWFRPC) has estimated that total agricultural acreage will increase between three and seven percent between 1995 and 2020. The council estimates that citrus acreage will increase between 54 and 81 percent and sugarcane between 62 and 190 percent. This large increase in citrus and sugarcane acreage is mainly due to the conversion of existing irrigated acreage from other crop types to citrus and sugarcane. The agricultural industry, in concurrence with the Caloosahatchee Advisory Committee, has projected that citrus and sugarcane will each have 125,000 acres in production by 2020.

### Water Demands

Because measured withdrawal data were not available, different methods were used for estimating agriculture self-supplied water demand for the *Caloosahatchee Water Management Plan*. The procedure used estimated current water use based on three approaches: evaluation of permitted water use allocation records, Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) water demand modeling, and integrated surface water/ground water modeling using MIKE SHE. In each approach, the demand was related to current land use. The resulting demands from each approach were reviewed to evaluate reasonableness.

The first method, Permit Allocation, determines water usage based on the permit allocation information. In this method, the permitted water use was reviewed to determine how much water had been allocated. This value would indicate the amount of water that had been requested, but not necessarily currently used. Water use demands were then applied to the District's 1995 land use coverage.

The second method, AFSIRS, is a simple water budget model for estimating irrigation demands that estimates demand based on basin specific data. This model coupled with a water balance component (WATBAL) in combination allows representation of irrigation demands and runoff from irrigated and nonirrigated lands within the basin.

The third method, MIKE SHE, is an integrated surface water/ground water model, which includes a module for estimating supplemental irrigation requirements based upon land use, soil type, crop type, rainfall, and evapotranspiration. It has the capability to utilize a vast amount of raw and processed data to estimate crop needs.

The three methods show some differences in the estimated irrigation requirements for the 1995 period. These differences are a function of the degree of averaging that each model utilizes and the assumptions of each method. **Table B-11** summarizes these results.

The MIKE SHE method was selected as the preferred approach for projecting the 2020 water demand, because it has the advantage of a spatially distributed estimate of demands and runtime response to change in hydrology, land use, and management practices. In addition, MIKE SHE computes the demand for the entire Caloosahatchee Water Management Planning Area and incorporate both surface and ground water interactions that impact the systems capability to satisfy irrigation demands within the study area. **Table B-11** illustrates the agricultural demands that were projected for the year 2020 using the MIKE SHE model.

**Table B-11.** Summary of Estimated 1995 and Projected 2020  
Water Demands for Agricultural Land Use Categories

Crop Type	Estimated 1995 Water Use (1,000 acre-feet/year)			
	1995			2020
	Permit Allocation	AFSIRS	MIKE SHE	MIKE SHE
Citrus	226		143	242
Sugarcane	216		110	181
Vegetables	32		36	27
Total	474	225	289	450

## REFERENCES

SFWMD. 1998. *Districtwide Water Supply Assessment*. Planning Department, South Florida Water Management District, West Palm Beach, FL.